Cryogenic blackbody (cavity radiator) specification document
June 23rd, 2005

1) The vendor shall provide a point of contact for all communications with the NASA / Goddard Space Flight Center (GSFC) technical monitor.

2) The cryogenic blackbody (CBB) shall be fabricated and calibrated to meet or perform better than all requirements and specifications listed in this document.

CBB Specifications

3) The minimum operating temperature (T) of the CBB shall be: ambient + 80 K. For example, if the ambient temperature is 70 K, the minimum operating temperature shall be 150 K.

4) The maximum operating temperature of the CBB shall be at least 800 K.

5) The CBB shall consume less than 30 W of power while operating at 800 K, with a goal of as little power consumption as possible.

6) The CBB shall be designed to operate in a high vacuum environment (pressure less than 1×10^{-4} torr).

7) The CBB shall be designed with accessible bolt holes such that it may be mounted to a generic baseplate. The CBB may be delivered already attached to a baseplate.

8) The CBB shall be less than 4 inches in diameter and less than 5 inches in length.

9) The CBB shall have a radiation exit aperture of 0.25 inches.

CBB aperture wheel

10) The CBB shall have an aperture wheel that allows selection of three (3) or more aperture diameters. Diameters shall be: 5 mm, 3 mm, and 1 mm.

11) The aperture wheel shall operate at cryogenic temperature.

12) The aperture diameters shall be known and measured to better than +/- 0.010 mm.

13) The aperture wheel shall mount rigidly to the CBB, and shall be removable.

14) The distance between the CBB exit aperture and the aperture wheel shall be known to better than 0.05 inches. Upon removal and remounting of the aperture wheel, the distance shall be repeatable to better than 0.05 inches.

Cavity temperature

15) The CBB cavity temperature stability shall be better than +/- 0.05 K per 4 hours.

16) The CBB cavity temperature shall be resolvable to better than 0.05 K.

17) The CBB cavity temperature shall be accurate to better than +/- 0.05 K.

18) The emissivity of the CBB cavity shall be reported to at least two decimal places, and the uncertainty shall be less than 0.01, between 0.6 μm and 5.0 μm. For example, the vendor may report "the emissivity of the cavity is 0.995 +/- 0.005 from 0.6 to 5.0 μm."

19) If the emissivity of the CBB varies with wavelength, the vendor shall provide a table showing emissivity vs. wavelength. The table shall include at least 10 equally spaced wavelengths between 0.6 μm and 5.0 μm. The initial tabulated value shall be 0.6 μm, and the final tabulated value shall be 5.0 μm. For example, spacing intervals may be 0.44 μm for a total of 11 data points.

Deliverables and due dates

Cryogenic blackbody	13 weeks ARO
base unit	
operating manual	
temperature controller	
aperture wheel and controller	
Final report	13 weeks ARO
product dimensions	
aperture diameters + uncertainty	